DMG/ek4 3/27/2015

FILED
3-27-15
01:55 PM

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Integrate and Refine Procurement Policies and Consider Long-Term Procurement Plans.	Rulemaking 13-12-010 (Filed December 19, 2013)

ADMINISTRATIVE LAW JUDGE'S RULING DIRECTING SOUTHERN CALIFORNIA EDISON COMPANY TO PERFORM PRODUCTION COST SIMULATIONS FOR THE INTERIM VARIABLE INTEGRATION COST ADDER

This Ruling directs Southern California Edison Company (SCE) to be the project manager and coordinate with Pacific Gas and Electric Company (PG&E) and San Diego Gas & Electric Company (SDG&E) to perform the production cost simulations as specified in Attachment 1 of this ruling. The results of the simulations will inform the development of the variable component of the interim integration cost adder (integration adder) for use in the Renewables Portfolio Standard (RPS) procurement Least-cost, Best-fit (LCBF) evaluation and the RPS Calculator.

Assembly Bill (AB) 2363 (Ch. 610) modified Public Utilities Code Section 399.13, which requires the Commission to include in the RPS procurement LCBF evaluation:

> (I) Estimates of electrical corporation expenses resulting from integrating and operating eligible renewable energy resources, including, but not limited to, any additional wholesale energy and capacity costs associated with integrating each eligible renewable resource.

> (II) No later than **December 31, 2015**, the commission shall approve a methodology for determining the integration costs described in sub clause (I). (Emphasis added)

In Decision (D.) 14-11-042 (2014 RPS Procurement Plans) the Commission referred to the integration adder as required by AB 2363 as costs[1] associated with making the system operationally flexible, which would reflect the costs of integrating intermittent renewable resources onto the grid.[2] While they were not explicitly adopted in the decision, based on the information received in this proceeding and D.14-11-042, integration costs are generally considered in three categories: 1) *variable*– incremental ancillary services and flexible capacity costs for increased operating reserve, 2) *curtailment* costs due to power system inflexibility, and 3) *fixed* (new flexible capacity) expenses.

D.14-11-042 adopted an interim, non-California (CA)-specific value for the variable cost component of the integration adder for wind and solar, which was based on a literature survey of studies of other jurisdictions as proposed by PG&E. The decision also adopted PG&E's proposed utility-specific interim fixed cost component based on each utility's Resource Adequacy flexible capacity requirement. The decision did not address curtailment costs, which are included here based on the information received in Phase 1A for future consideration. The interim integration adder (composed of variable and fixed costs) is in place until the Commission adopts a final methodology for the integration adder. The May 6, 2014 Scoping Ruling for this proceeding states that this proceeding will examine whether the tool used to determine flexible resource needs and/or any

---

[1] Levelized and expressed in terms of dollars per megawatt-hour ($/MWH).

[2] At 54. (http://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=143313500).

system procurement authorizations should be used to inform resource procurement decisions, such as through a renewable integration adder.[3]

In its September 24, 2014 testimony,[4] PG&E recommends that the Commission include in Phase 1B the development and approval of a methodology for calculating a CA-specific renewable integration adder in the 2014 LTPP for RPS procurement.[5] PG&E proposes using existing models such as the California Independent System Operator's (CAISO) PLEXOS deterministic model to calculate the variable integration cost component. PG&E's proposed methodology was also submitted in the 2014 RPS Procurement Plans in Rulemaking 11-05-005. The California Wind Energy Association and SCE also recommend undertaking efforts in Phase 1B to establish a methodology to calculate a renewable integration adder.[6]

D.14-11-042 affirmed that adopting a final methodology for the RPS integration adder is a top priority for the Commission.[7] It stated that the process going forward to consider the final methodology will be in coordination with

---

[3] At 6. (http://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=90548289).

[4] On Phase 1A/1B Issues and Scheduling for the 2014 LTPP.

[5] PG&E Opening Testimony in Phase 1A of the 2014 LTPP, Chapter 2 at 2-1. PG&E believes that "the production simulation models being used in Phase 1a can estimate the increase in variable costs associated with integrating intermittent renewable resource (i.e., wind and solar) additions under different scenarios. This analysis can capture the higher variable costs incurred due to increased intermittent renewables penetration in the form of increased ancillary services costs such as regulation and load following required to cover the forecast deviations and intra-hour variability associated with intermittent renewable generation.

[6] SCE Reply Comments on Nine-Point Implementation Plan at 7. (http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M146/K375/146375709.PDF).

[7] At 53.

this proceeding.[8] However, developing methodologies to inform a final integration adder is a complex process. As noted by the City of Redondo Beach, it in part depends on the final determination of flexible needs[9] (for the fixed cost component), which will not be determined in this proceeding per a Ruling on March 25, 2015. Therefore, it is reasonable to approach the various components of the integration adder in different stages.

As the first stage, it is feasible at a minimum to improve the variable cost component of the integration adder reflecting the CA-specific costs as intended by the legislature. As noted in PG&E's integration adder proposal, leveraging the existing production cost simulation models such as the CAISO's PLEXOS deterministic model in this proceeding would be a good starting point for the development of CA-specific marginal variable cost component of the integration adder for wind and solar, which comprise the largest portions of the RPS portfolio at 33% and beyond. Marginal value captures the incremental integration costs while not double counting energy costs, which is the definition of the integration adder for the LCBF evaluation of additional RPS procurement. It is reasonable to undertake this task in a two-step process.

In the first step, I direct SCE as the project manager to coordinate with PG&E and SDG&E to use the CAISO's PLEXOS deterministic model in this proceeding and perform the production cost simulation modeling with the specified criteria in Attachment 1. SCE possesses the technical knowledge and experience to perform this work, as demonstrated by its use of the PLEXOS platform and CAISO database to produce modeling results submitted as

---

[8] At 63-64.

[9] City of Redondo Beach Opening Testimony at 11.

testimony in this proceeding. SCE should provide the modeling results for party comments as per the schedule on this Ruling.

The second step will use the modeling results to calculate the variable cost component of the interim integration adder for wind and solar used for the RPS procurement LCBF evaluation and the RPS Calculator. Therefore, it is appropriate to address this second step in the new RPS rulemaking (R.15-02-020) on the utilities' 2015 RPS Procurement Plans and the RPS Calculator. The curtailment and fixed integration cost components of the integration adder will be addressed in later stages. The proceeding and process for these stages will be determined at a later time.

Consistent with parties' general consensus as discussed in D.14-11-042, the variable cost component should include: 1) the incremental costs associated with meeting net load ramps at the hourly and multi-hour level; and 2) the incremental costs of providing increased reserves for regulation and load following – for addressing intra-hour net load variability and uncertainty.

Attachment 1 provides more details and specific criteria required for SCE to perform the model runs. In order to provide an opportunity for party comments and meet the legislative deadline of December 31, 2015, SCE shall file the modeling results for the 33% cases by May 29, 2015 and the 40% cases by August 31, 2015. Parties may file comments no later than June 19, 2015 for the 33% cases and September 21, 2015 for the 40% cases. Reply comments are due on June 26, 2015 for the 33% cases, and September 28, 2015 for the 40% cases.

SCE should consult with Energy Division staff to make minor modifications to Attachment 1 if required in order for SCE to execute the modeling effectively and efficiently.

The following is the schedule for the activities ordered in this ruling:

	Item	Date
1	ALJ Ruling	3/27/15
2	SCE and Energy Division Staff Collaboration	March-August
3	SCE Modeling Results of 33% RPS Cases for Party Comments	5/29/15
4	Party Comments/Replies on the 33% RPS Results	6/19/15 6/26/15
5	SCE Modeling Results of 40% RPS Cases for Party Comments	8/31/15
6	Party Comments/Replies on the 40% RPS Results	9/21/15 9/28/15

IT IS RULED that:

1. Southern California Edison Company shall be the project manager and coordinate with Pacific Gas and Electric Company and San Diego Gas and Electric Company to use the California Independent System Operator's PLEXOS deterministic model in this proceeding and perform the production cost simulation modeling with the specified criteria in Attachment 1.

2. Southern California Edison Company shall file the modeling results for the 33% cases by May 29, 2015 and the 40% cases by August 31, 2015. Parties may file comments no later than June 19, 2015 for the 33% cases and September 21, 2015 for the 40% cases. Reply comments are due on June 26, 2015 for the 33% cases and September 28, 2015 for the 40% cases.

Dated March 27, 2015 at San Francisco, California.

/s/ DAVID M. GAMSON
David M. Gamson
Administrative Law Judge

ATTACHMENT 1

Attachment 1
SCE Production Cost Simulation Requirements for the Variable Cost Component of the Interim Integration Adder

Production Simulation Analysis

- Production simulation analysis is a commonly used technique for analyzing the hourly operations of an electric system and can therefore be used to analyze the operational (variable) cost of integrating renewable resources, such as wind and solar, onto the system.
- The values that are important for the RPS Calculator and RPS procurement are the *marginal* values (represented in the form of an "integration adder" for each resource type) that reflect the change in total net integration cost on the system that occurs when an additional MW of a particular resource type is added.
- Comparing the cost results of production simulation cases with and without a specific renewable resource provides an estimate of the marginal impact of that resource on operational costs.

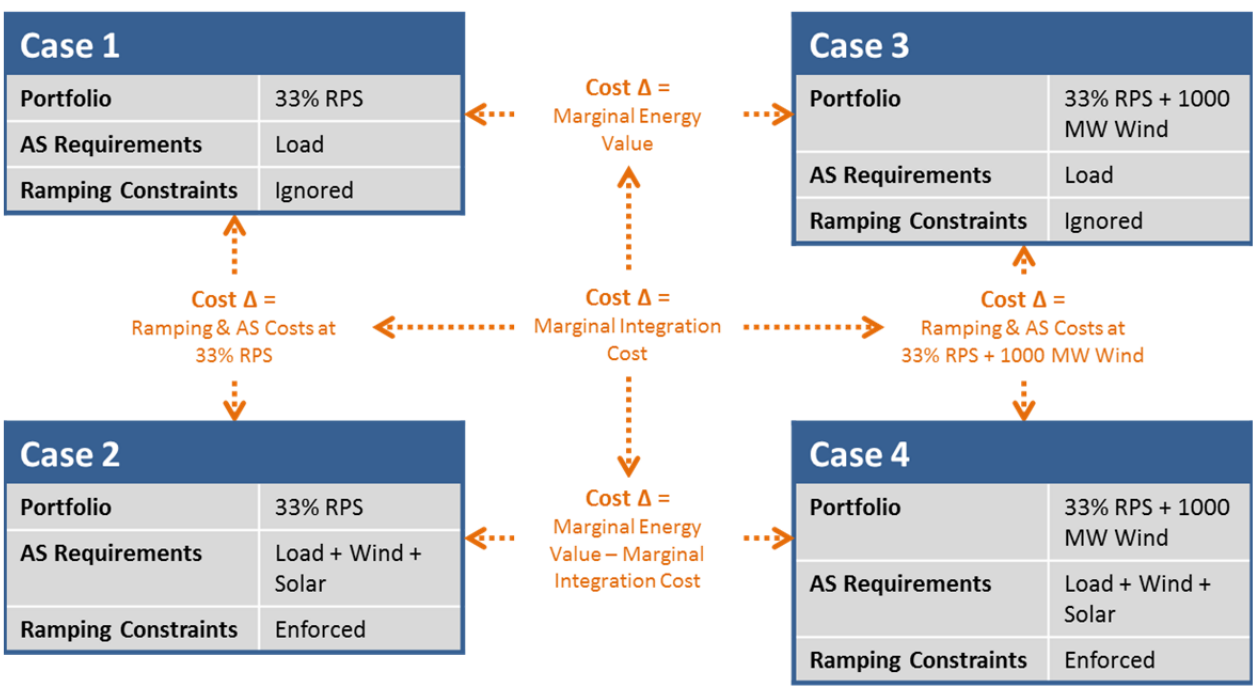
Separation of Energy Value and Variable Integration Adder

- A simple comparison of dispatch costs between two cases would capture the combined effect of the "energy value"—the savings associated with displaced fuel and reduced Operating & Maintenance (O&M) costs—and the variable "integration costs"—the costs associated with the increased need for operational flexibility to meet inter-hour ramps and increased ancillary service's needs.
- For the RPS Calculator, it is necessary to separate these two components since energy value is already captured through a dispatch "stack" analysis. This requires four separate production simulation cases to establish a marginal variable integration cost estimate for a specific resource type, as illustrated in Figure 1.
- The specific formula for determining variable integration costs will depend on the method used for valuing energy dispatch savings. The formulation must be carefully developed to ensure that all cost and

value categories are captured in the overall evaluation, and that no component is double-counted.

- For the RPS Calculator, the variable integration cost that should be calculated include two components:
  - The incremental costs associated with meeting net load ramps at the hourly and multi-hour level, and
  - The incremental cost of providing increased operating reserves—Regulation and Load Following—for addressing intra-hour net load variability and uncertainty.
- Because of the challenges associated with isolating integration costs from energy value and the need to avoid double-counting in the net market value used by utilities for RPS procurement, it is recommended that utilities be encouraged to submit their own integration adders as needed for consistency with the methodology used for energy value.

Figure 1. Illustrative use of four production simulation cases to calculate marginal integration cost for a specific resource type.



Determining Integration Costs at 33% RPS

- The marginal cost of renewable integration will change with the penetration and mix of renewable resources.

- Renewable procurement decisions will be best served with a marginal integration cost adder that approximates the expected portfolio based on prior procurement decisions made by utilities, which, today, brings the system roughly close to 33%.
- Accordingly, the highest priority should be developing marginal integration cost adders for wind and solar resources at and beyond 33%, which can be derived through a series of six cases built from the 33% case developed in LTPP. Table 1 shows the sequence of production simulation runs that would be necessary for this.

Table 1. Configuration of specific cases needed to calculate marginal wind and solar integration costs at 33% RPS

ID	Portfolio	Reserves	Ramping Constraints
1	33% RPS	Load	Ignored
2	33% RPS	Load + Wind + Solar	Enforced
3	33% RPS + 1000 MW Wind	Load	Ignored
4	33% RPS + 1000 MW Wind	Load + Wind + Solar	Enforced
5	33% RPS + 1000 MW Solar	Load	Ignored
6	33% RPS + 1000 MW Solar	Load + Wind + Solar	Enforced

Determining Integration Costs at 40% RPS

- Additional integration cost adders will be needed at higher levels of penetration. Examining the marginal integration cost of wind & solar resources in one or more 40% portfolios would provide an important indicator to the market as to the sensitivity of integration cost to increasing penetrations of various resource types.
- Each portfolio examined would require twelve additional runs (for a total of eighteen), structured in the same manner as those presented in Table 1.

Table 2. Configuration of specific cases needed to calculate marginal wind and solar integration costs at 40% RPS

ID	Portfolio	Reserves	Ramping Constraints
1	40% RPS, High Solar	Load	Ignored
2	40% RPS, High Solar	Load + Wind + Solar	Enforced
3	40% RPS, High Solar + 1000 MW Wind	Load	Ignored
4	40% RPS, High Solar + 1000 MW Wind	Load + Wind + Solar	Enforced
5	40% RPS, High Solar + 1000 MW Solar	Load	Ignored
6	40% RPS, High Solar + 1000 MW Solar	Load + Wind + Solar	Enforced
7	40% RPS, High Wind	Load	Ignored
8	40% RPS, High Wind	Load + Wind + Solar	Enforced
9	40% RPS, High Wind + 1000 MW Wind	Load	Ignored
10	40% RPS, High Wind + 1000 MW Wind	Load + Wind + Solar	Enforced
11	40% RPS, High Wind + 1000 MW Solar	Load	Ignored
12	40% RPS, High Wind + 1000 MW Solar	Load + Wind + Solar	Enforced

Incremental Wind and Solar
33% RPS cases:

- 1000 MW of incremental wind = 500 MW Solano wind + 500 MW Tehachapi wind.
- 1000 MW of incremental solar = located in southern California with single axis tracking technology.

40% RPS cases:

- High wind portfolio mix incremental to the 33% portfolio = 70% wind, 20% solar, 10% geothermal.
- High solar portfolio mix incremental to the 33% portfolio = 70% solar, 20% wind, 10% geothermal.
- 1000 MW of incremental wind = 500 MW Solano wind + 500 MW Tehachapi wind.
- 1000 MW of incremental solar = located in southern California with single axis tracking technology.

Developing the necessary data to calculate the variable integration cost at 33% RPS

- The CAISO 2024 PLEXOS production simulation case would be an appropriate starting point for calculating marginal integration costs at 33% RPS. The case already includes sufficient renewable energy to meet the 33% RPS target, along with rooftop solar resources that do not count toward the RPS but do add to integration burdens.
- Energy+Environmental Economics (E3) would provide the reserve requirements to perform the calculations specified above[10]:
    - Case 1: Regulation and Load Following requirements for load only (assuming renewable shapes are fixed and known).
    - Case 2: Regulation and Load Following requirements for load, wind and solar at 33%.
    - Case 3: Regulation and Load Following requirements for load only (same as Case 1).
    - Case 4: Regulation and Load Following requirements for load, wind and solar at 33% + 1000 MW of wind.

[10] Using E3's Excel tool implementing the National Renewable Energy Laboratory (NREL) methodology and is generally consistent with the methodology of CAISO 's "Step 1 PNNL tool." The E3 tool uses simplified assumptions to calculate load following requirements consistent with the NREL and "Step 1" methodologies, which is appropriate for the modeling as specified here.

  - o Case 5: Regulation and Load Following requirements for load only (same as Case 1).
  - o Case 6: Regulation and Load Following requirements for load, wind and solar at 33% + 1000 MW of solar.
- E3 would also provide the renewable output shapes to represent the additional 1000 MW of wind and solar capacity.

Developing the necessary data to calculate the variable integration costs at 40% RPS

- The CAISO 2024 PLEXOS production simulation case at 33% RPS would be used as the starting point for the 40% cases. Additional wind and solar would be added to the cases in varying proportions as specified above.
- E3 would develop the 40% High Wind and High Solar cases and provide the renewable output shapes needed to ensure compliance under these cases.
- E3 would provide the reserve requirements to perform the calculations specified above:
  - o Case 1: Regulation and Load Following requirements for load only (same as Case 1 for 33%, assuming same load).
  - o Case 2: Regulation and Load Following requirements for load, wind and solar under 40% High Solar case
  - o Case 3: Regulation and Load Following requirements for load only (same as Case 1)
  - o Case 4: Regulation and Load Following requirements for load, wind and solar under 40% High Solar case + 1000 MW of wind
  - o Case 5: Regulation and Load Following requirements for load only (same as Case 1)
  - o Case 6: Regulation and Load Following requirements for load, wind and solar under 40% High Solar case + 1000 MW of solar
  - o Case 7: Regulation and Load Following requirements for load only (same as Case 1)

  - Case 8: Regulation and Load Following requirements for load, wind and solar under 40% High Wind case
  - Case 9: Regulation and Load Following requirements for load only (same as Case 1)
  - Case 10: Regulation and Load Following requirements for load, wind and solar under 40% High Wind case + 1000 MW of wind
  - Case 11: Regulation and Load Following requirements for load only (same as Case 1)
  - Case 12: Regulation and Load Following requirements for load, wind and solar under 40% High Wind case + 1000 MW of solar
- E3 would also provide the renewable output shapes to represent the additional 1000 MW of wind and solar capacity.

(END OF ATTACHMENT 1)